THE CLAIMS

What is claimed is:

1. A wafer susceptor for use in a substrate processing system, comprising:

at least one recess formed therein, with each recess is arranged and configured to hold at least one substrate therein, wherein a combination of said wafer holder and said at least one substrate forms a composite substrate having uniform processing characteristics.

2. The wafer susceptor of Claim 1, wherein said uniform processing characteristics of said composite substrate are achieved by matching physical properties of said wafer susceptor and said substrates.

3. The wafer susceptor of Claim 3, wherein said physical properties comprise at least one property selected from the group consisting of:

Thermal coefficient of expansion;

Reflectivity;

Thermal mass;

Thermal conductivity;

Electrical resistivity;

Dielectric constant;

Dielectric loss;

Density;

Hardness; and

Emissivity.

Claim 3

The wafer susceptor, wherein said wafer susceptor is used in a semiconductor substrate processing system, comprising a reactor having at least one single substrate deposition chambers, and further comprising an automated substrate transport assembly including a wand array comprising a plurality of wands constructed and arranged to simultaneously transport a corresponding plurality of substrates into and out of the deposition chamber.

4. The system of claim 5, further comprising an automated substrate transport assembly arranged for serially transporting single ones of a plurality of substrates into and out of the deposition chamber.

5. The system of claim 5, further comprising an automated substrate transport assembly.

6. The system of claim 7, further comprising a substrate cassette for storage and bulk transport of plural arrays of substrates, and position able in substrate pickup and substrate delivery relationship to the automated substrate transport assembly.

7. The system of claim 8, further comprising an automated substrate transport assembly including a wand array comprising a plurality of wands constructed and arranged to simultaneously transport a corresponding plurality of substrates into and out of the deposition chamber, wherein the automated substrate transport assembly and substrate cassette are constructed and arranged so that when the automated substrate transport assembly is translated into a pickup position relative to the substrate cassette, said plurality of wands engage and extract a plurality of substrates from the substrate cassette, with each wand engaging and extracting a substrate from a different one of said plural arrays of substrates, and so that when the automated substrate transport assembly is translated into a deposit position relative to the

substrate cassette, said plurality of wands release and deposit a plurality of substrates on the substrate cassette, with each wand releasing and depositing a substrate into a different one of said plural arrays of substrates.

8. The system of claim 5, further comprising an automated substrate transport assembly including a double-sided wand array comprising a plurality of wands constructed and arranged to simultaneously transport a corresponding plurality of substrates into and out of the deposition chamber.

9. The system of claim 5, further comprising a loadlock chamber, and a windless automated substrate transport assembly including a multiparted cassette, and a transport arm arranged to selectively engage said multiparted cassette and disengage from said multiparted cassette in the loadlock chamber.

10. The system of claim 5, further comprising an etch chamber for regeneration of a wafer, at least two wafer holders and an automated substrate transport assembly arranged to introduce one of said at least two wafer holders into the reactor while another of

said at least two wafer holders is in said etch chamber, and to thereafter extract wafer holders from the reactor and etch chamber, followed by introduction of the wafer holder from the etch chamber into the reactor, and introduction of the wafer holder from the reactor into the etch chamber.

11. The system of claim 5, wherein the wafer holder has two recesses therein.

12. The system of claim 5, wherein the wafer holder has four recesses therein.

13. The system of claim 5, wherein the wafer holder has a diameter in the range of from about 200mm to about 350mm.

14. The system of claim 5, wherein the wafer holder has a diameter in the range of from about 200mm to about 300mm.

15. The system of claim 5, wherein each of the wafer holder recesses has a diameter in the range of from about 100mm to about 150mm.

16. The system of claim 5, wherein each of the wafer

holder recesses has a diameter in the range of from about 100mm to about 125mm.

17. The system of claim 5, further comprising a substrate cassette including slot members for positioning substrates in plural arrays, and wherein successive arrays are in side-by-side relationship to one another.

18. The system of claim 19, wherein the substrate cassette is constructed and arranged for holding two arrays of substrates, wherein all substrates are planar and each respective substrate in a first array is generally coplanar with a corresponding respective substrate in a second array.

19. The system of claim 20, wherein the first and second arrays are parallel to one another.

20. The system of claim 5, further comprising an automated substrate transport assembly and a substrate cassette, wherein the substrate holder, automated substrate transport assembly, and substrate cassette are constructed and arranged to simultaneously process two substrates.

21. The system of claim 5, wherein the reactor comprises a single wafer deposition chamber sized for processing single substrates having a 200mm diameter.

22. The system of claim 5, wherein the plurality of recesses formed in the wafer holder are arranged and configured to hold substrates having a 100mm diameter.

23. The system of claim 5, wherein each of the recesses formed in the wafer holder is circular.

24. The system of claim 5, further comprising a processor for programmably operating the automated substrate transport assembly according to a cycle time program.

25. A method of increasing the throughput of a single substrate deposition chamber, said method comprising:

positioning in said single substrate deposition chamber a wafer susceptor having at least one recess formed therein, with each recess being arranged and configured to hold at least one substrate therein, wherein a combination of said wafer susceptor and at least one substrate form a composite substrate having uniform processing characteristics.

26. The method of Claim 25, wherein said uniform processing characteristics of said composite substrate are achieved by matching physical properties of said wafer susceptor and said substrates.

27. The method of Claim 26, wherein said physical properties comprise at least one property selected from the group consisting:

thermal coefficient of expansion;

reflectivity;

thermal mass;

thermal conductivity;

electrical resistivity;

dielectric constant;

dielectric loss;

density;

hardness; and

emissivity.

28. The method of claim 27, further comprising providing an automated substrate transport assembly including a wand array comprising a plurality of wands

constructed and arranged to simultaneously transport a corresponding plurality of substrates into and out of the deposition chamber.

29. The method of claim 27, further comprising providing an automated substrate transport assembly arranged for serially transporting single ones of a plurality of substrates into and out of said deposition chamber.

30. The method of claim 27, further comprising providing an automated substrate transport assembly.

31. The method of claim 30, further comprising providing a substrate cassette for storage and bulk transport of plural arrays of substrates, wherein the cassette is position able in substrate pickup and substrate delivery relationship to the automated substrate transport assembly.

32. The method of claim 31, further comprising providing an automated substrate transport assembly including a wand array comprising a plurality of wands constructed and arranged to simultaneously transport a corresponding plurality of substrates into and out of the deposition chamber, wherein the substrate cassette

contains plural arrays of substrates, and positioning the substrate cassette in substrate pickup and substrate delivery relationship to the automated substrate transport assembly; and operating the semiconductor processing system by:

translating the automated substrate transport assembly into a pickup position relative to the substrate cassette, so that the plurality of wands engage and extract a plurality of substrates from the substrate cassette, with each wand engaging and extracting a substrate from a different one of the plural arrays of substrates;

translating the automated substrate transport assembly carrying the engaged and extracted substrates to the deposition chamber and releasing the substrates into respective recesses in the wafer holder;

depositing thin film material on the substrates in the deposition chamber, to yield coated substrates;

translating the automated substrate transport assembly into the deposition chamber after the depositing step is completed and extracting the coated

substrates from the respective recesses in the wafer susceptor;

translating the automated substrate transport assembly carrying the extracted coated substrates into a deposit position relative to said substrate cassette or a second substrate cassette, and releasing the coated substrates to said substrate cassette or a second substrate cassette;

whereby the throughput of the semiconductor processing system is increased relative to serial transport and processing of individual substrates.

33. The method of claim 27, comprising using a double-sided wand assembly comprising a plurality of wands and arranged to simultaneously transport a corresponding plurality of substrates into and out of the deposition chamber.

34. The method of claim 27, comprising sequentially using multiple wafer holders including positioning one of the multiple wafer holders in the deposition chamber for processing of wafers thereon, and concurrently regenerating another of said wafer holders after it

has been in the deposition chamber during processing of wafers thereon.

35. The method of claim 34, wherein said regenerating comprises etch processing of said another of said wafer holders.

36. The method of claim 27, wherein the wafer holder has two recesses therein.

37. The method of claim 27, wherein the wafer holder has four recesses therein.

38. The method of claim 27, wherein the wafer holder has a diameter in the range of from about 200mm to about 350mm.

39. The method of claim 27, wherein the wafer holder has a diameter in the range of from about 200mm to about 300mm.

40. The method of claim 27, wherein each of the wafer holder recesses has a diameter in the range of from about 100mm to about 150mm.

41. The method of claim 27,, wherein each of the wafer

holder recesses has a diameter in the range of from about 100mm to about 125mm.

42. The method of claim 27, further comprising providing a substrate cassette including slot members for positioning substrates in plural arrays, and wherein successive arrays are in side-by-side relationship to one another.

43. The method of claim 27, further comprising providing a substrate cassette that is constructed and arranged for holding two arrays of substrates, wherein all substrates are planar and each respective substrate in a first array is generally coplanar with a corresponding respective substrate in a second array.

44. The method of claim 43, wherein the first and second arrays are parallel to one another.

45. The method of claim 27, further comprising providing an automated substrate transport assembly and a substrate cassette, wherein the substrate holder, automated substrate transport assembly, and substrate cassette are constructed and arranged to simultaneously process two substrates.

46. The method of claim 27, wherein the reactor comprises a single wafer deposition chamber sized for processing single substrates having a 200mm diameter.

47. The method of claim 27, wherein the plurality of recesses formed in the wafer holder are arranged and configured to hold substrates having a 100mm diameter.

48. The method of claim 27, wherein each of the recesses formed in the wafer holder is circular.

49. The method of claim 27, further comprising providing an automated substrate transport assembly for transporting substrates into and out of the deposition chamber, and programmably operating the automated substrate transport assembly according to a cycle time program.